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AUTHOR Tirri, Kirsi
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ABSTRACT

This paper reports findings from a study of Finnish academic Olympians of different ages who participated in Olympiad Studies in mathematics, physics, or chemistry during the years 1965-1997. The study focused special interest on the influences of home and school in contributing to the development of academic talent. The results of the Finnish study are compared to an earlier U.S. study using the same instruments. The Finnish Olympians were mailed a 14-page questionnaire and the self-confidence attitude attribute scales; their parents received a shorter version of the same questionnaire and the inventory of parental influence. Data included 150 males and 7 females. More than half of the Olympians were first-born children; parents had either a very high educational level or a very low educational level; and parents had good incomes. Olympians and their parents were asked to rate the importance of family/school influences in development of academic talent, and parents rated these influences as more important than did the Olympians. Finnish Olympians emphasized their own interests and efforts as key factors to their talent development, as well as good teachers. They noted few hindrances to their talent development. More than half expressed the view that they would not have accomplished as much without the Olympiad program. Data are going to be compared with similar data from the United States, Germany, and Taiwan. (Contains 21 figures, 7 tables, and 11 references.) (BT)

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Professor Kirsi Tirri
University of Helsinki
Department of Education
P.O. Box 39
FIN-00014 University of Helsinki
Finland

SO 031 925

Kirsi Tirri

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A paper presented at the American Educational Research Association, New Orleans, April 2000

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Professor Kirsi Tirri
University of Helsinki
Department of Education
P.O. Box 39
FIN-00014 University of Helsinki
Finland

Introduction

Finland has a history of achieving high standards in academic literacy. According to IEA study of reading literacy, Finland ranked number one of all the participating 32 countries. Finnish students showed the highest reading literacy levels at both 9 and 14 years of age in almost all domains (Elley 1992). This result is remarkable because Finnish children do not begin formal schooling until age seven, whereas in most remaining countries students begin to read at age six or younger. In Finland, as in other Scandinavian countries, society has traditionally attached great importance to special education as a means of looking after its weakest members, children with learning difficulties or behavioral problems (Urban & Sekowski 1993, 785). Gifted and talented children have been taught in an ordinary classroom without any acceleration and grouping options. In recent years Finland has made an effort to increase educational opportunities for gifted students. These opportunities include flexible decisions in acceleration and ungraded school, which allows students to advance in their studies with a flexible schedule. Several enrichment alternatives include intensive summer camps in mathematics and Open University programs in math and physics. These projects are available for gifted learners on a voluntary basis (Tirri 1997).

The official educational policy in Finland advocates increasing studies in science and mathematics. Computer skills and the new information technology have also received special attention in the national Finnish educational strategy (Ministry of Education 1995). Finland has participated in Olympian programs for several years. Separate programs exist for the Math, Physics and Chemistry Olympiads. In recent years programs have been created for Biology and Computer Science as well. Distinct studies have been undertaken in each of these academic areas. In Math, Physics and Chemistry Olympiad programs series of increasing difficult tests are administrated. The end result of this testing concludes with the identification of the top national finalist (6-20 Olympians). These individuals are trained to compete in the International Olympiad programs. In this paper, we report findings from Olympians of different ages who have participated to Olympiad Studies in math, physics or chemistry during the years 1965-1997. A special interest is shown to the influences of home and school in contribution to the development of academic talent. The results of Finnish study are compared to the earlier American study using the same instruments (Campbell 1996b).

Methods and procedures

The Olympians in Finland were mailed a 14-page questionnaire and the self-confidence attitude attribute scales (SaaS) (Campbell 1996a). Their parents were mailed a shorter version of the same questionnaire and the inventory of parental influence (IPI) (Campbell 1996a). The duplication of questions from both sources was employed to assure validity in the responses and also to compare the varying perceptions of parents and their children. Two waves of mailing were used during an eight-month period. The packets were mailed to all the Olympians in math, physics and chemistry whose current addresses could be found. The packets included questionnaires both for the Olympians and their parents. The Olympians were asked to forward the parent questionnaire to their own parents. Four Olympians were dead, ten of them had kept their current addresses as secrets, twenty of them could not be located and ten of them lived overseas in United States and Europe. The sample, then, consisted of 242 Olympians with valid addresses. The response rate from these Olympians was 65% (157 usable replies), and from their parents the response rate was 70% (169 responses).

Finnish Olympians data included 150 males and only 7 females. The total number of females who have participated in Olympics during the years 1965-1997 is fourteen. The sample consists of 72 mathematics, 50 physics and 35 chemists. The data includes Olympians of different ages. The oldest Olympians are over 50 years old and some of them had participated to the first Olympiad competition in Mathematics in 1965. The data includes very young Olympians who are under 21 years old and have participated to the Olympics in recent years. However, majority of the Olympians (over 80%) belong to the age groups between 21 to 40 (see Table 1).

Table 1. Description of Finnish Olympians

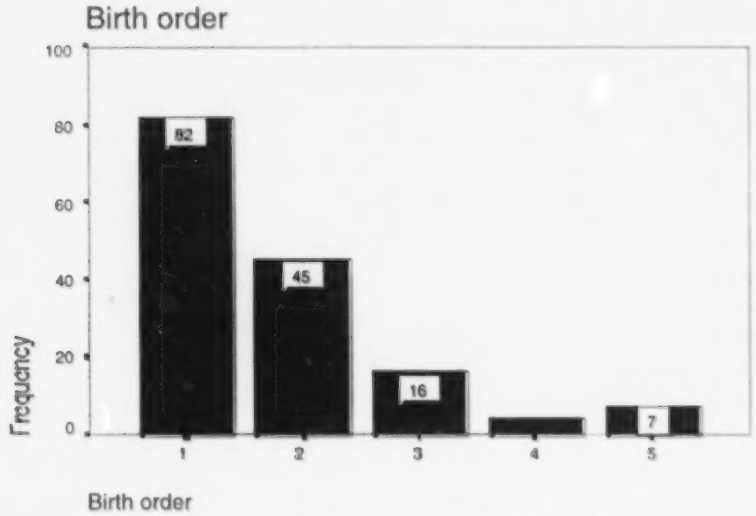
Sex of the Olympian	(N)	(%)
Male	150	96
Female	7	5
Olympians type		
Mathematics	72	46
Physics	50	32
Chemistry	35	22
Classified age		
under 21	4	3
21-30	65	41
31-40	63	40
41-50	17	11
over 50	4	3
missing	4	3

Family background factors

Birth order of the Olympians

More than a half of the Olympians were first-born children of their families. In Figure 1 can be seen the frequencies of the birth order. 53 % (N=82) of the Olympians were first born, 29 % (N= 45) were second, 10 % (N=16) were third, 2% (N=4) were fourth and 4 % (N=7) were fifth. This is not a surprising finding since the research on families of gifted and talented children indicate that the first-born children have higher IQ scores and they usually achieve more than their siblings throughout the life (Freeman 1993, Walberg & Marjoribanks 1976, Walberg & Starhia 1992).

Figure 1. Birth order of the Olympians



The first-borns were shown to be the successful ones in this study as well. Fifteen of the Finnish Olympians had participated to the Olympics twice. An interesting observation is that nine of them were first-born children of their families. Majority of the Olympians reported that they were at least among the top ten in their school. However, a half of the first born Olympians had ranked best in their school in their graduation from high school (see Figure 2). In American study two-thirds (66%) of the Olympians were first-born child in small families (1.42 children) (Campbell 1996b). In Finnish study the Olympians came from larger families. Only eleven of the Olympians were only children and 55% of them had two or more siblings. In Figure 3 can be seen that the first-borns had the largest number of siblings in our study.

Figure 2. Matriculation examination success and birth order

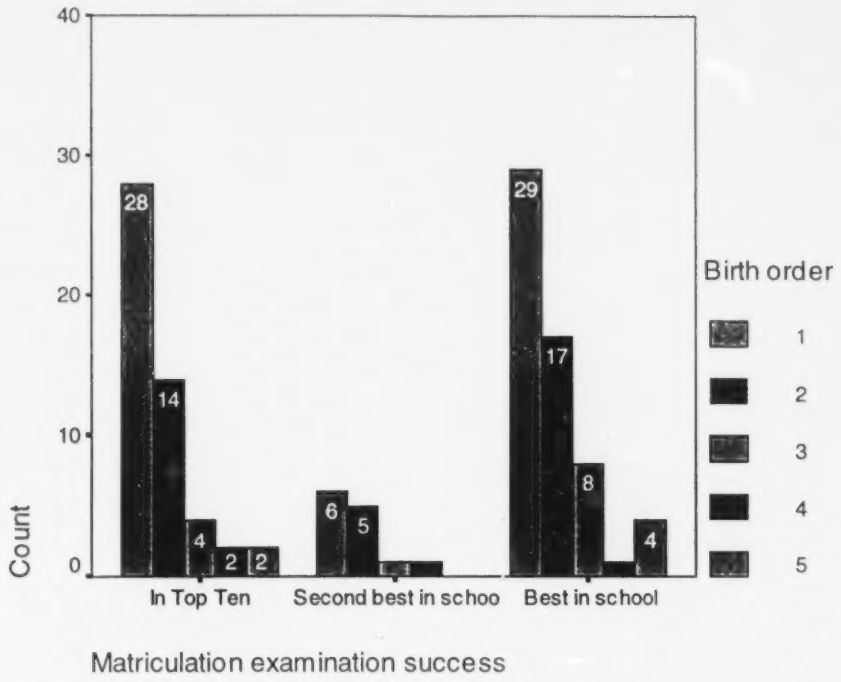
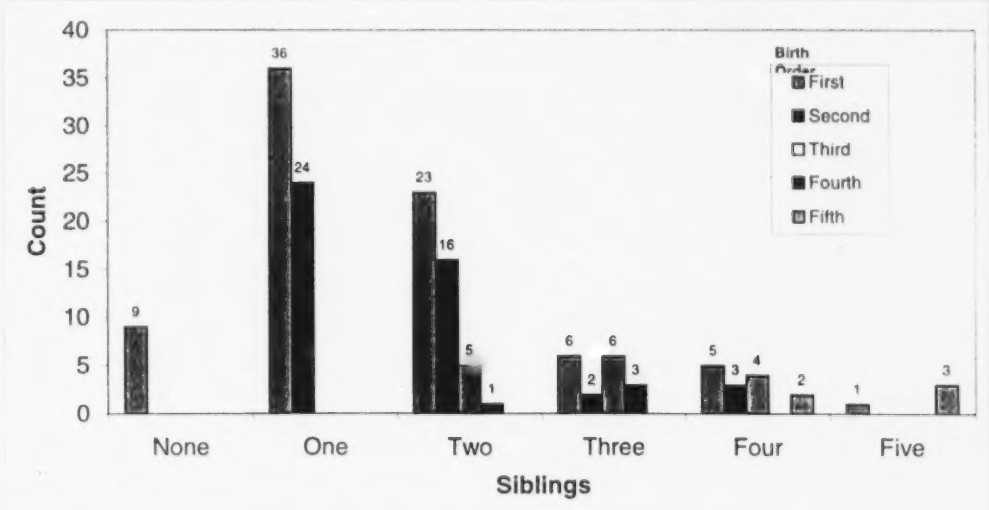


Figure 3. Siblings and birth order



Socioeconomic factors

A multi-item measure of socioeconomic status (SES) was calculated for each Olympian. We used the guide to code occupational and socioeconomic status scores

developed by Nam & Powers (Miller 1991). Nam-Powers socioeconomic status scores combine education, income, and occupation in a multi-item index. It provides a direct and objective measurement of SES. The advantage of Nam-Powers scale is that it provides combined scores for men and women. To calculate SES for each Olympian we performed the following steps: firstly we categorized both parents educational level by giving equivalent points in scale (Table 2), secondly we categorized parents income information (Table 3) and finally in third phase we produced a new variable, the Finnish adjusted "SES" value, by adding education, income and occupation and dividing the outcome by the number of factors (Table 4).

Table 2. Categories for parents' educational level

Class	Points	Education (Father)	Education (Mother)
Class 1	13	Less than secondary school graduate	Less than secondary school graduate
Class 2	50	Secondary school graduate	Secondary school graduate
Class 3	76	Some studies in university	Some studies in university
Class 4	92	Degree, post-graduate degree	Degree, post-graduate degree

Table 3. Categories for parents' income level

Class	Points	Incomes FIM (1U$=6.3 FIM)
Class 1	7	- 39 999
Class 2	21	40 000 – 79 999
Class 3	38	80 000 – 119 999
Class 4	54	120 000 – 159 999
Class 5	67	160 000 – 199 999
Class 6	81	200 000 – 239 999
Class 7	93	240 000 – 279 999
Class 8	98	280 000 -

Table 4. The formula for calculating Finnish SES

Educational level + Incomes + Occupation = SES

Parents' educational level

The mothers of the Finnish Olympians had either a very high educational level with a graduate degree or a very low educational level with less than secondary school graduation. As Figure 4 indicates 41% (N=64) of the mothers ranked to the highest educational class and 34% (N=53) of them to the lowest one. 25% (N=39) of the mothers were classified to the categories of secondary school graduate and some studies in university. The fathers of the Finnish Olympians had very similar profile of their educational level to the mothers. In fathers' case the tendency to belong either to the highest or to the lowest educational level was even more evident. More than 50% (N=79) of the fathers ranked to the highest educational class and 41% (N=64) of them to the lowest class. Only 9% (N=13) of the fathers were classified to the middle classes for their educational level (see Figure 5).

Figure 4. Educational level of mothers

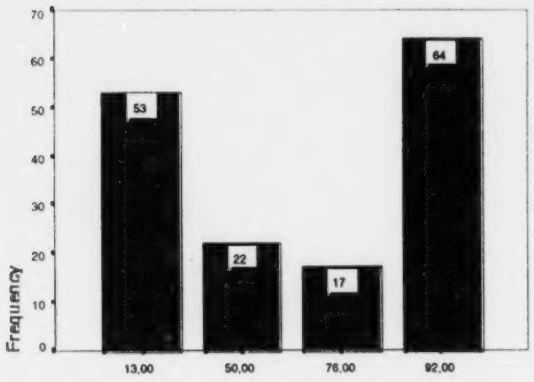
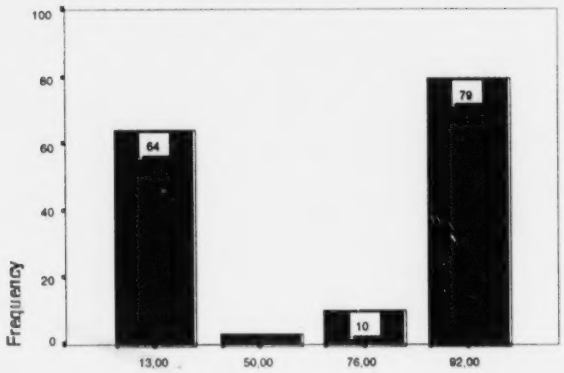


Figure 5. Educational level of fathers



Parents' Income

The parents of Finnish Olympians had a good income (see Figure 6). An interesting observation is that the mothers had somewhat better income than the fathers. More mothers (34%) than fathers (31%) belonged to the highest income category. Furthermore, fewer mothers (4%) than fathers (10%) belonged to the two lowest income categories. Mothers' and fathers' income levels are shown in Figures 7 and 8.

Figure 6. Parents' income levels

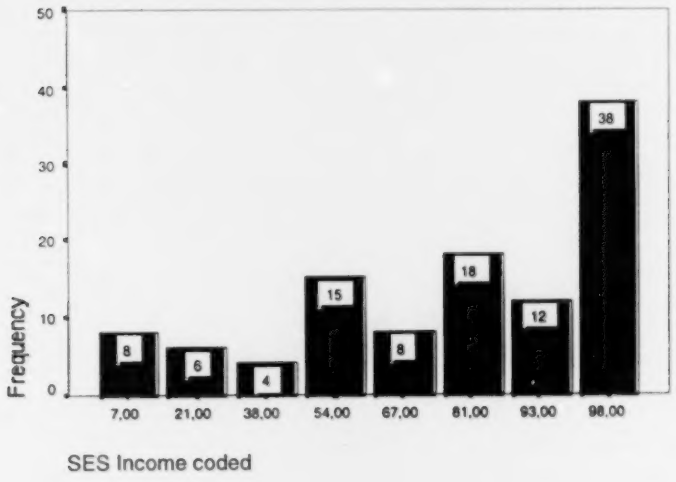


Figure 7. Mothers' income levels

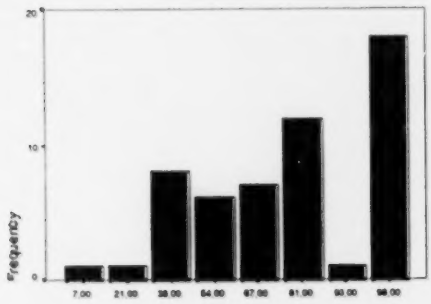
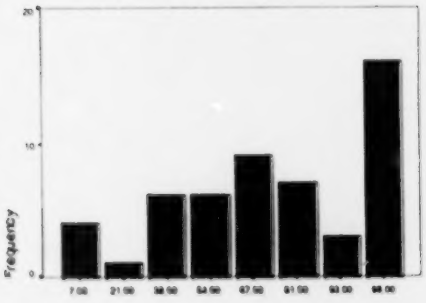


Figure 8. Fathers' income levels



Parents' Occupation

Parents' occupations were given scores according to the status scores by different occupational categories (Nam-Powers Score). The scores were divided to three categories. 60% (N=94) of the fathers belonged to the most prestige occupational category. This category includes professional specialty occupations, for example physicists, physicians, dentists, lawyers, post-secondary teachers etc. However, more fathers (22%) belonged to the lowest occupation category of laborers than to the middle category of sales workers and technicians (18%). Figure 9 illustrates the distribution of frequencies for fathers' occupational categories. Mothers' occupational profiles were very much in accord with fathers' profiles. As Figure 10 demonstrates, 43% of the mothers belonged to the highest status in their occupational category. More mothers (31%) belonged to the lowest occupational category than to the middle one (26%).

Figure 9. Fathers' occupation 3 categories

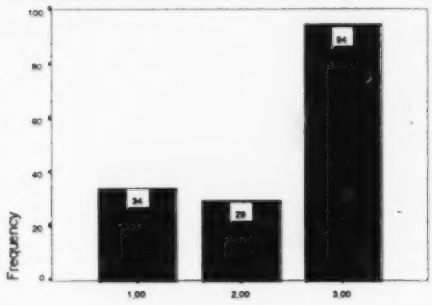
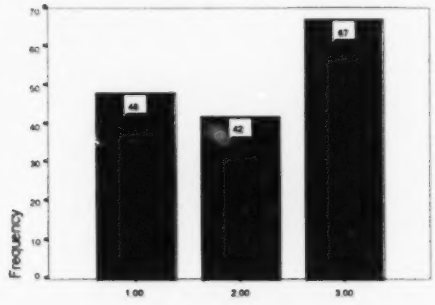


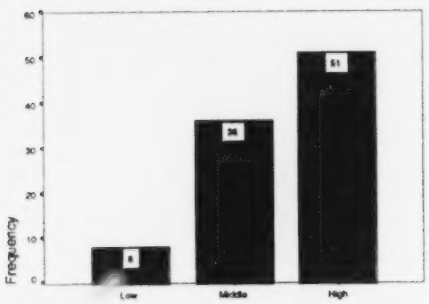
Figure 10. Mothers' occupation 3 categories



SES

The final SES score was calculated by adding the scores from parents' education, income and occupation together and dividing the outcome by the number of factors (see Table 4). Parents' SES was categorized to low, middle or high classes. 33% (N=51) of the Olympians came from high-level socioeconomic status homes. 23% (N=36) of the Olympians were ranked to the middle category and only 5 % (N=8) could be classified to the lowest SES category. We should observe that in many questionnaires the income data was missing and we could classify SES for 95 cases from 157. Figure 11 demonstrates the frequencies of the 3 SES categories

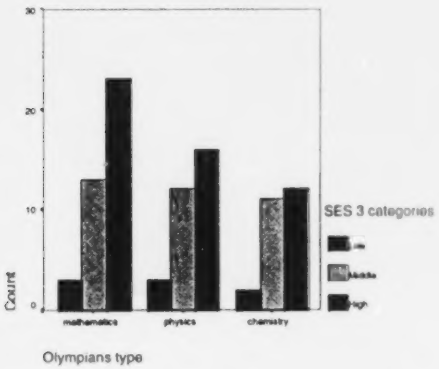
Figure 11. SES 3 categories (N=95)



SES Comparisons

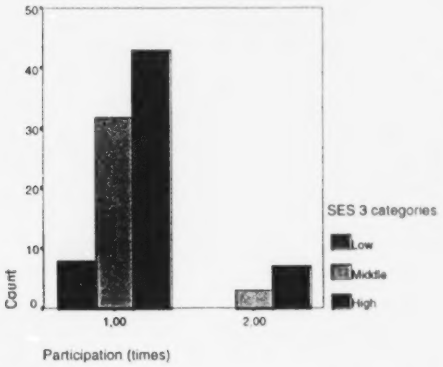
Majority of the Olympians came from the highest SES background. Figure 12 illustrates the SES categories by Olympians type. Regardless of the subject of the Olympian the profiles of their SES were quite similar (see Figure 12). However, the number of mathematics in the highest SES category is bigger compared with the numbers of physics and chemistry (see Figure 12).

Figure 12. Olympians type by SES



Ten Olympians who had reported the information for calculating SES had participated to the Olympic studies twice. As the Figure 13 demonstrates, majority of those who had participated twice came from the highest SES background. Nobody from the lowest SES category had participated to the competition more than once.

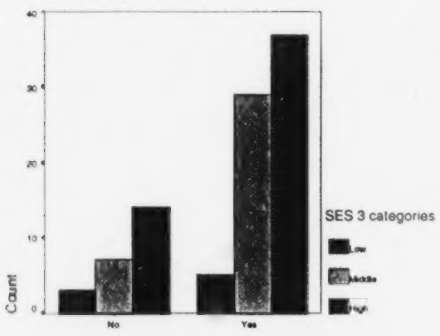
Figure 13. Participation times by SES



Wellfare

SES status has effects on the educational resources of the Olympians. The Olympians were asked whether they own a computer. In Figure 14 can be seen that majority of the Olympians owned a computer. The socioeconomic status did not determinate the ownership. Olympians who belonged to the highest SES category ranked first in both groups: owners of the computers and those who did not own one.

Figure 14. Own computer



Elitism / hostility

The highest SES status of an Olympian did not explain possible accusations of elitism. As Figure 15 demonstrates, majority of the Olympians in all SES categories had not experienced accusations of elitism. Those who reported experiences like that belonged mostly to the middle SES category. Some of the Olympians from the Highest SES group had experienced accusations of elitism but none from the lowest SES Category had. Most of the Olympians reported that they had not endured hostility because of their talents. Less than one third of the Olympians reported experiences of hostility. As Figure 16 demonstrates, all those Olympians belonged to the highest or middle SES categories. Concerning our findings, we claim that elitism accusations and hostility are explained more with the SES status than giftedness. In our study the Olympians from the lowest SES group had not reported any experiences of accusations of elitism or hostility.

Figure 15. Endured elitism accusations

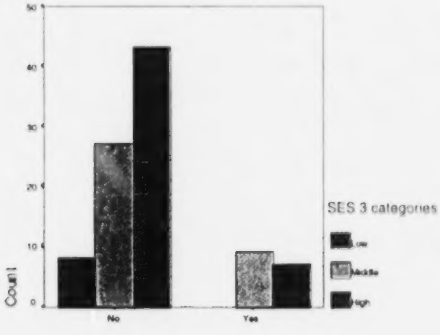
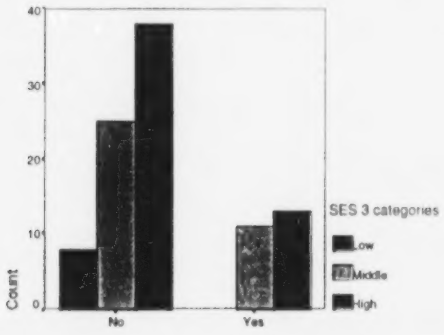


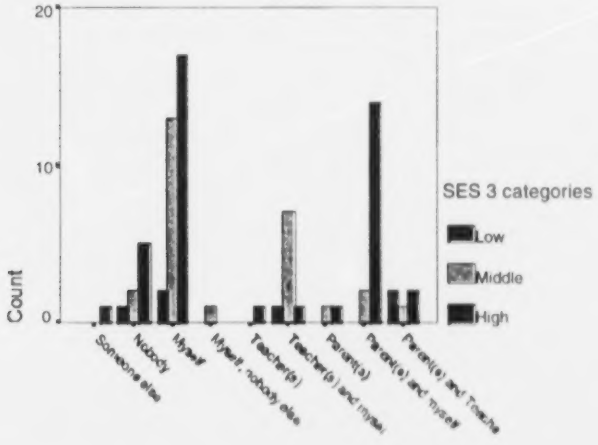
Figure 16. Endured hostility



Support / family

The Olympians were asked to evaluate who was the most influential person (s) responsible for the development of their academic talent. The Olympians from the highest SES category have rated themselves and parent(s) and themselves as the most influential persons to develop their academic talent (see Figure 17). The Olympians from the middle SES category viewed themselves and teachers and themselves as the most influential persons. The Olympians from the lowest SES category rated themselves and parent(s) and teacher(s) as the most influential people to develop their academic talent. We can conclude that all the Olympians regardless of their socioeconomic status viewed themselves as the most influential person in the development of their giftedness.

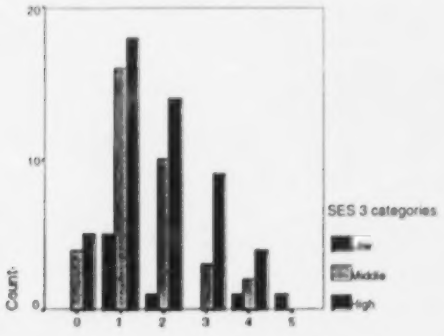
Figure 17. Most influential persons for the development



Siblings

The Finnish Olympians came from larger families than in the other studies of gifted children (Campbell 1996b). Furthermore, the Olympians from the highest socioeconomic backgrounds had the biggest number of siblings. As the Figure 18 demonstrates, Olympians from the highest SES group had more siblings than the Olympians from the other SES groups. The Olympians from the lowest socioeconomic background had the smallest number of siblings.

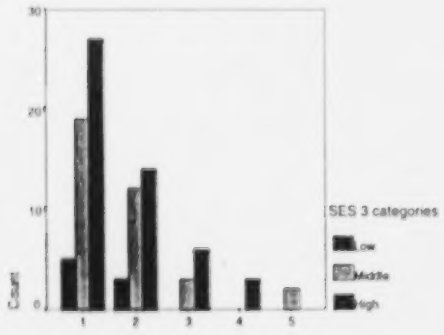
Figure 18. The number of siblings



Birth order

As mentioned earlier, majorities of the Olympians were first-born sons. Furthermore, the first-born children came mostly from the highest socioeconomic background. Figure 19 illustrates the birth order by 3 SES categories.

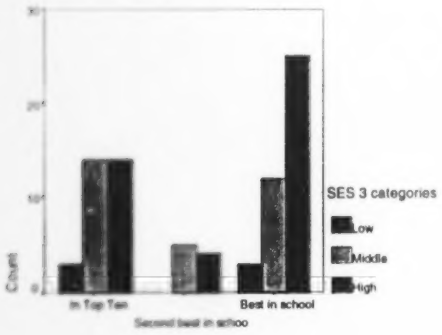
Figure 19. Birth order



Success in matriculation examination

The Finnish Olympians were all very successful at school. Most of them ranked as least in top ten of the high school graduates. However, the Olympians who belonged to the highest SES category were more often the best students in their school (see Figure 20).

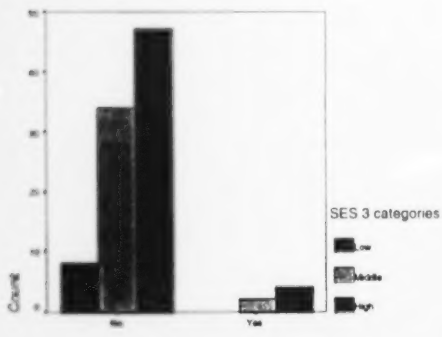
Figure 20. Matriculation examination success



Gifted programs

Most of the Finnish Olympians did not have any kind of special educational arrangements for gifted children during their time at school. These arrangements include opportunities to study according to an advanced program or a special class for gifted students. As figure 21 illustrates, only a few of the Olympians had had a chance for special arrangements in their studies. Those Olympians who had had these kinds of opportunities came from high or middle socioeconomic backgrounds (see Figure 21).

Figure 21. Gifted programs or classroom



Development of academic talent

Family/School influence

The Finnish Olympians and their parents were asked to rate the importance of Family/School influences to the development of the academic talent of the Olympian. The instrument included 14 items and used a 5-point Likert scale. Table 5 shows the means and the standard deviations of both Olympians and their parents. As the results indicate, parents have rated all the Family and School influences more important than the Olympians. Furthermore, parents' ratings differed significantly from their children's ratings in nine of the items (see Table 5).

Table 5. Possible conributing factors to the development of academic talent as rated by Olympians and their parents

	Child		Parent		
	Mean	Std.dev.	Mean	Std.dev.	F
FA1	1,57	1,83	1,79	1,75	1,24
FA2	3,15	1,38	3,82	1,05	23,94 ***
FA3	2,52	1,49	2,97	1,36	7,73 ***
FA4	3,66	1,24	3,84	1,12	1,84
FA5	1,36	1,43	2,79	1,48	71,79 ***
FA6	1,34	1,64	1,44	1,46	0,31
FA7	2,18	1,65	2,50	1,55	3,14
FA8	2,42	1,68	2,72	1,50	2,81
FA9	1,70	1,38	2,52	1,31	29,16 ***
FA10	1,53	1,33	2,97	1,48	81,57 ***
FA11	1,89	1,43	3,28	1,33	78,90 ***
FA12	1,92	1,49	3,16	1,27	61,36 ***
FA13	2,05	1,41	3,21	1,37	54,92 ***
FA14	2,07	1,44	3,09	1,32	42,22 ***

The Finnish Olympians rated the item FA4 "Home atmosphere was very conductive to learning" as the most influential factor for their talent development (X=3.66, SD=1.24). The parents were very much in accord with their children and ranked home atmosphere as the most influential factor in development of academic talent (X=3,84, SD=1,12). The second highest rated item for Olympians was FA2 "A great teacher(s)" (X=3.15, SD=1.38). The parents had rated the importance of teachers even higher than their children (X=3,82, SD=1,05). This difference in their ratings was statistically significant (F=23,94***). The item FA6 "Stimulating influence of a particular relative" was rated as the least important influence for the talent development by Olympians (X=1.34, SD=1.64) followed by the item FA 5 "A school program that was designed to develop talent" (X=1.36, SD=1.43). The parents had rated the influence of a school program much more important for the development of the

academic talent as their children had (F=71,79***). Furthermore, parents regarded factors related to reading as more influential factors than their children did. A statistically significant difference was found in the items FA3 "Abundance of books in our home" (F=7,73***), FA 9 "Magazines that were accessible" (F=29,16***), and FA 10 "Everyone in the family was an avid reader" (F=81,57***). The parents also considered the parental influence greater than the Olympians did. The items FA 11 "My mother's recognition of my talent" (F=78,90***), FA 12 "My father's recognition of my talent" (F= 61,36), FA 13 "My mother's active encouragement" (F=54, 92***), and FA 14 "My father's active encouragement" (F=42,22***) all received higher ratings from the parents.

In addition to the quantitative scale, the Olympians were given a chance to describe other factors that helped them to develop their talent. The most frequently mentioned factor (N=15) was their active use of library. Finland has invested to public libraries and library buses that bring books even to the isolated areas all over the country. An effective library service can be one explanation to the high reading literary of Finnish children. For the Olympians libraries were resources that helped them to find books of their interest without any financial investments. Almost all the Olympians reported active reading as one of their favorite hobbies. Parents and home atmosphere were reported as the second most frequent factors (N=12) that helped the Olympians to develop their talent. Olympians mentioned things like "academic atmosphere", "supportive atmosphere without any pressures", "freedom to explore things", "older siblings and their homework", "genetic heredity" as examples of their supportive home atmosphere.

The Finnish Olympians emphasized their own interests and efforts as key factors to their talent development. They have mentioned " good memory", "self-discipline", "hate for loosing", "desire to compete", "my own inner drive", "my early learning in math and reading" as important factors influencing their talent development. The teachers are given credit though. Ten Olympians have reported "excellent teachers" and "teachers' active encouragement" as important factors for their talent development.

Hindrances

The Finnish Olympians reported very few hindrances for their talent development. Only the items SC 6 "Not enough challenge" (X=2.50, SD=1.73) and SC 5 "Courses were taught at too low a level for me" (X=2.39, SD=1.67) were ranked as factors hindering some of their talent development. However, one should observe that the Olympians had the most variance in these too items, too. Evidently these two hindrances have been greater for some of the Olympians than for the others. The parents were very much in accord with their children of the factors that hindered the development of the academic talent. They had rated the lack of challenge and too easy courses as the most influential factors hindering the development of their children's talent (see Table 6).

The parents had rated some of the hindrances more influential than their children. A statistically significant difference was found in the items SC 2 "He/she knew more than many of the teachers" (F=9,02***), SC 3 "Some teachers were not respectful of

his/her talent" (F=17,18***), SC 4 "Insensitivity of some of the teachers" (F=8,39***), SC 9 "Rigidity of courses" (F=4,27*), and SC 10 " Other students' treatment of your child" (F=9,05***).

Table 6. Hindrances to the development of academic talent

	Child		Parent		
	Mean	Std.dev.	Mean	Std.dev.	F
SC1	1,36	1,36	1,46	1,44	0,36
SC2	0,94	1,16	1,37	1,33	9,02 ***
SC3	0,84	1,20	1,47	1,41	17,18 ***
SC4	0,97	1,25	1,43	1,43	8,39***
SC5	2,39	1,67	2,31	1,58	0,17
SC6	2,50	1,73	2,34	1,66	0,71
SC7	1,53	1,50	1,73	1,47	1,32
SC8	1,90	1,50	1,85	1,53	0,07
SC9	1,45	1,41	1,80	1,51	4,27*
SC10	1,23	1,39	1,74	1,53	9,05 ***
SC11	0,99	1,42	0,93	1,18	0,19

Those who had experienced other negative school influences were given a chance to describe them in a qualitative way. The most frequently mentioned negative experience was the envy of other children. Twenty Olympians reported "bullying", "harassment", "ignorance", "envy and jealousy" by their schoolmates as their dominating school experiences. The Finnish educational system with its emphases on equality was also mentioned as a hindrance for their talent development. This trend includes lack of special arrangements for the gifted students and teaching that was directed for the mediocre students. These negative experiences had caused frustration and lack of interest for the Olympians.

Olympiad program

The Olympians were asked to evaluate the influence of Olympiad program for their talent development. More than half of the Olympians expressed the view that they would not have accomplished as much without the program (see Table 7). Almost half of the Olympians viewed that participation helped them to accept their talents. They reported that international contacts made them realize their talents better and increased their self-confidence. Only 2 % of them thought it hindered the development of their talent in any way. Sixty percent of Olympians reported that the program had increased well or little of their awareness of educational opportunities. However, most of the Olympians reported that they had already made their educational choices before the participation. The participation mainly confirmed their earlier plans. More than half of the Olympians viewed that participation in program had positively changed others' attitudes toward them. They reported that the publicity and respect by others was a positive experience. Only 2 % of them reported negative changes in peoples'

attitudes. These individuals expressed that they had always been regarded as weird anyway.

More than 60% of the Olympians recommended including elements of Olympians in gifted programs. They had not had much negative consequences or burnout due to the program. Over 70% of the Olympians had not experienced any negative consequences and only eight percent reported burnout due to Olympics. Many of them emphasized the freedom of choice for the participation and the short-term commitment requested. Those who reported burnout due to Olympics explained it by their physical illness or disappointments caused by their performance. A few Olympians expressed the view that the Olympiad program was too intensive and abstract.

Most of the Olympians reported that Olympiad experience was an encouraging and interesting experience that felt like an adventure. Several Olympians wrote qualitative comments about that experience describing their experiences in the following ways. "My first time in a foreign country", "It was wonderful to meet other talented people with the same interest", "First time in my life I was really challenged", "I learned how much I knew by comparing my knowledge with the talents of students from other countries", "It really boosted my self-confidence! "I got new friends", "I had a romance with a foreign girl", and "It was a break from the Army".

It is possible that the Finnish Olympians represent gifted individuals who have been mostly motivated by their own inner drive. They had not been pressured or trained only for the Olympiad experience. This trend was revealed in their qualitative responses and it can explain the low pressure and burnout experienced by them. They had always studied hard and the Olympiad program brought them international contacts and social experiences that they remembered for the rest of their lives.

Table 7. Olympians' assessments of Olympiad program (Finland)

Would Olympian have accomplished as much without the program? (%)	
Yes	43
No	57
Did the Olympiad program make Olympian aware of educational opportunities? (%)	
Very well, some	42
Little	28
None	30
Participation in program changed others' attitudes toward Olympians? (%)	
Positive changes	55
No change	43
Negative changes	2
Missing	1
Participation helped/hindered Olympians to accept their talents? (%)	
Helpful	45
Neither helped nor hindered	20
Hindered	2
Not applicable	33 (incl. 1% missing)

International perspectives to talent development

The Finnish Olympiad data are going to be compared with equal data from United States, Germany and Taiwan. The cross-cultural comparison will reveal the factors in their talent development that are common to all the Olympians. These factors can be identified as invariant components of talent development that are shared by all the Olympians. In addition to invariant components, we aim at identifying culture-dependent components that discern Olympians from different countries. These culture-dependent components are factors that are typical for each participating country. In the future studies, the views of Olympians' parents are compared to the views of their children. These studies help us to identify invariant and culture-dependent factors in raising the gifted children. The results of our study can contribute valuable information about different ways to encourage mathematical talent. A special interest will be shown to the female Olympians and the ways to encourage gifted females to select career in science.

References

Campbell, J. 1996a. Developing cross-national instruments: using cross-national methods and procedures. International Journal of Educational Research Vol. 26, 6, pp. 497-522.

Campbell, J. 1996b. Early identification of mathematics talent has long-term positive consequences for career contributions. International Journal of Educational Research Vol. 26, 6, pp. 497-522.

Elley, W. 1992. How in the world do students read? IEA study of reading literacy. Germany: GRINDELDRUCK GMBH.

Freeman, J. 1993. Parents and families in nurturing giftedness and talent. In K. A. Heller, F.J. Mönks & A.H. Passow (Eds), International handbook of research and development of giftedness and talent, pp. 669-683. Oxford: Pergamon Press.

Miller, D. 1991. Handbook of research design and social measurement. London: SAGE.

Ministry of Education 1995. Knowledge strategy of education and research. Helsinki: The State Printing Press.

Tirri, K. 1997. How Finland meets the needs of gifted and talented students. High Ability Studies, Vol. 8, 2, pp. 213-222.

Urban, K. & Sekowski, A. 1993. Programs and practices for identifying and nurturing giftedness and talent in Europe. In K. A. Heller, F.J. Mönks & A.H. Passow (Eds), International handbook of research and development of giftedness and talent, pp. 779-797. Oxford: Pergamon Press.

Walberg, H.J. & Marjoribanks, K. 1976. Family environment and cognitive development: Twelve analytic models. Review of Educational Research, 46, pp. 527-551.

Walberg, H.J. & Stariha, W. 1992. Productive human capital: learning, creativity, and eminence. Creativity Research Journal, 5, pp. 323-340.